CLAIMS

What is claimed is:

1	1. A system for manipulating data in a state holding elements array, the system comprising:
2	a process controller for moving process data through an array of processing units coupled
3	to a state holding elements array;
4	a scan controller for scanning scan data out of the state holding elements array, the scan
5	controller including:
6	a cascaded group of state holding elements, each of the state holding elements
7	being a single unpaired state holding element;
8	a clock shifter for controlling movement of data out of each state holding element
9	in the cascaded group; and
10	means for permitting shifting of a datum from a first state holding element in the
11	cascaded group to a second state holding element in the cascaded group only if
12	the second state holding element does not contain a valid datum at that time; and
13	a controller coordinator for controlling a mutually exclusive operation of the process
14	controller and the scan controller.
1	2. The system of claim 1, wherein the clock shifter comprises:
1	a plurality of clock AND gates;
2	a same clock input line connected to multiple clock AND gates in the plurality of clock
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4	AND gates; and
5	a plurality of clock latches each having: a control input connected to an output of another clock latch,
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7	a clock input connected to the same clock input line, and
8	a clock latch output each connected to one of the multiple clock AND gates,
9	wherein the clock shifter splits a same clock input into sequentially propagating clock signals,
10	such that at a first time, only a first clock AND gate in the multiple clock AND gates outputs a
11	first cycle of a clock signal, and at a second subsequent time the first clock AND gate and a
12	second clock AND gate output a second cycle of the clock signal.

- The system of claim 1, further comprising: 1 3. 2
- an output register comprising a plurality of receiving latches, each receiving latch being connected to a scan-out end of one of the rows of state holding elements. 3
- The system of claim 1, wherein the state holding elements are latches. 4. 1
- A method for manipulating data in a state holding elements array, the method 1 5. 2 comprising:
 - enabling a process controller, coupled to a state holding elements array, to move process data through an array of processing units coupled to the state holding elements array;
 - enabling a scan controller, coupled to the state holding elements array, to scan data out of the state holding elements array, the scan controller:
 - shifting a first valid datum out of a downstream state holding element in a cascaded group into a state holding element of an output register, the cascaded group including a plurality of single unpaired state holding elements;
- subsequently shifting a second valid datum from an first upstream state holding 10 element into the downstream state holding element; and 11
- subsequently shifting a third valid datum from a second upstream state holding 12 element into the first upstream state holding element, whereby each shift of valid 13 data is into a holding element that does not contain valid data at the time of the 14
 - enabling a controller coordinator to control a mutually exclusive operation of the process controller and the scan controller.
 - The method of claim 5, further comprising: 6.

shift; and

controlling a timing of the shifting of the data out of the cascaded group such that the 2 shifting ends when all data is shifted out of the cascaded group. 3

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- The method of claim 6, further comprising: 1 7. shifting new data, from an input register, into the cascaded group such that each state 2 holding element in the cascaded group contains unique data. 3 A computer program product, residing on a computer usable medium, for manipulating 1 8. data in a state holding elements array, the computer program product comprising: 2 program code for enabling a process controller, coupled to a state holding elements array, 3 to move process data through an array of processing units coupled to the state holding elements 4 5 array; program code for enabling a scan controller, coupled to the state holding elements array, 6 to scan data out of the state holding elements array, the scan controller: 7 shifting a first valid datum out of a downstream state holding element in a 8 cascaded group into a state holding element of an output register, the cascaded 9 group including a plurality of single unpaired state holding elements; 10 subsequently shifting a second valid datum from an first upstream state holding 11 element into the downstream state holding element; and 12 subsequently shifting a third valid datum from a second upstream state holding 13 element into the first upstream state holding element, whereby each shift of valid 14 data is into a holding element that does not contain valid data at the time of the 15 shift; and 16 program code for enabling a controller coordinator to control a mutually exclusive 17
 - program code for enabling a controller coordinator to control a mutually exclusive operation of the process controller and the scan controller.
 - 9. The computer program product of claim 8, further comprising:
 - program code for controlling a timing of the shifting of the data out of the cascaded group

 such that the shifting ends when all data is shifted out of the cascaded group.
 - 10. The computer program product of claim 8, further comprising:
 - program code for shifting new data, from an input register, into the cascaded group such that each state holding element in the cascaded group contains unique data.

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